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THE MANAGEMENT OF IMPORTED AND ENDEMIC COMMON PARASITIC DISEASES  
BY THE PRIMARY HEALTH CARE SYSTEM IN CANADA

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## INTRODUCTION

The changing picture of international travel and immigration in the last decade has led to a shift in parasitic disease prevalence in this society. Diseases once considered exotic and of academic interest only, are virtually day to day factors in primary health care delivery in many Canadian cities today.

This paper proposes to outline the problem of intestinal parasitic disease and of malaria as it confronts the primary health care system, a system which, by virtue of its training and practice, remains, with only a few exceptions, totally unprepared for the task.

At no point in the text is it intended to make value or moral judgements on immigrants, immigration policy, or ethnic origin. It is intended, however, to illustrate how effectively and simply the problem of communicable and/or costly disease can be handled in the primary health care setting. The importance of that level of treatment of parasitic disease will be demonstrated by:

- i) simple reference to costs of consultation in such cases;
- ii) cost of needless laboratory diagnosis ordered by physicians who do not have adequate knowledge;
- iii) the need to interrupt transmission cycles of significant parasites;
- iv) the need to prevent a growing endemicity of potentially communicable parasites.

## LITERATURE REVIEW

The present day problem of level of imported parasitic disease has been reported to some degree in the literature in the past. Lenczner published in 1968 (Tropical and Parasitic Diseases: The Impact On Our Civilization, Modern Medicine, August 26, 1968) describing the improvement in travel and resultant rise in parasitic disease. Lenczner again later in several articles continued to show that the levels of parasitic diseases were rising. Most of the articles stress also the diagnostic complexities of parasitic conditions. They do not cover therapy. Lenczner also published figures of the Clinic for Tropical Diseases, Toronto General Hospital, showing the increase in number of travellers and immigrants seen at that clinic.

H. Leriche and Lenczner in an article in the Canadian Medical Association Journal (Vol. 109, September 15, 1973) described changing immigration patterns and the spread of various diseases. They also make reference to the fact that teaching of physicians is lacking in the area of parasitic diseases. Leriche also published an article attacking the complacency toward the rising level of communicable diseases in Canada since 1950 and again cites the need for better teaching of the subject of parasitic disease.

Other authors, such as Freeman, Laird and Eaton have described the levels of intestinal parasitic disease in native communities in Canada.

There are no studies, however, which show the levels in the various factions of the general Canadian population. Data is just now starting to be gathered in this area by various health departments. It is obvious by a search of the literature that good prevalence studies are needed to determine the exact degree of the obviously increasing problem of parasitic diseases.

## THE RAPIDITY OF TRAVEL

A good connection through London can get a traveller from East Africa to Canada in twenty hours. The increase in efficiency of air travel has done away with the more natural quarantine of slower forms of transportation. As a result, persons in asymptomatic or incubatory stages of disease can easily pass without detection.

A more active external aid policy has increased the number of technical advisors in tropical developing areas. Many go with adequate instruction and preparation and have an excellent chance of not acquiring any significant diseases. Others, however, go with no preparation at all, take no preventive measures and end up loaded with parasitic diseases, some of which are communicable and some of which can be very debilitating or life threatening.

A common source of the latter problem is high school and college students who go to developing areas for holiday trips without adequate preparation or knowledge. Their mode of travel is often hitchhiking and food and shelter are obtained where possible. The exposure to disease is, therefore, at indigenous levels and the rate of infection of these young people is high. It is again not meant here to moralize about the mode of travel and certainly not about the communion with local people. It is meant, however, to point out that such travellers should be quickly and adequately screened, treated and returned to functioning health by the primary health care system when they come back home.

Immigration is also a source of potentially communicable parasites and the topic is covered in the section on "Importation of Parasitic Disease".

## THE PROBLEM

The primary health care system, consisting of general practitioners, medical officers of health, public health nurses in schools, communities and industries and health inspectors must become the major segment of the health care system to deal with intestinal parasitic diseases.

The main requirement to change the present inadequate state of knowledge and practice (for the most part) in the handling of these diseases is the awakening of an awareness that these parasites exist and also the interest to put forth a slight effort to learn about them.

It is not enough to look at the long biological name on the laboratory report form, throw up the arms in despair, claim that this has never been a requirement of practice here and refer the patient. A general practitioner would not dream of referring an upper respiratory infection to a respiratory specialty clinic. Likewise, it is not logical that simple parasitic diseases be referred to specialty clinics at increased cost and inconvenience to all concerned.

Along the same lines, it is time that bowel x-rays, cholangiograms, fat studies and biochemistry not be ordered as the first diagnostic procedures on patients from tropical areas with bowel symptoms. So many cases are referred after a battery of tests have failed to make a diagnosis where a simple stool examination for ova and parasites would have given the answer.



Furthermore, patients are referred within a week of a barium study and stool examinations are invalid during that period (8). Thus the patients have to be rebooked for examination and costs and level of inconvenience are increased.

The increase in cost to the system is as a result of the consultation fees, repeated laboratory work ordered at consultation and follow-up visits. Costs can also be considerably raised if one considers patient time lost from work waiting for referral, going to the consultation and, depending on the parasite, morbidity of the infection. The expenses of needless radiographic and laboratory procedures done in lieu of stool ova and parasites in relevant situations, is obvious.

These are basic points in primary care parasitology and should be becoming common knowledge if the system is to adequately handle the diseases.

## IMPORTATION OF PARASITIC DISEASES

The endemic level of parasitic intestinal disease in Canada is generally quite low. Since basic epidemiological studies have been rare in this area, the actual figures are really unknown. It is higher in certain native Indian groups.

At the present time with a shift in immigration and an increase in international travel of all types, there is a definite increase in the level of parasitic disease.

Figure I shows a steady rise in the total number of immigrants from tropical areas. Asian immigrants numbered approximately 20,000 in 1971 whereas the number approximated 4,000 in 1955. Similar increases were seen in immigrants from the West Indies, Latin America and Africa (9).

Figure II shows the percentage composition of immigrant arrivals by country of last permanent residence (Canada 1955 to 1971). In 1955 the percentage of tropical immigrants was approximately 30% whereas in 1971 this percentage had risen to over 50%. This fact is of interest for purposes of this paper only in relation to importation of intestinal parasites. The parasites in question abound in all tropical areas and in certain parts of Europe. Endemic levels are high in those areas and the influx to Canada is becoming quite significant.

Figures in this paper are based on official immigration data and the records of various clinics and community services. (9,4,6,7). True figures on the number of illegal immigrants

are, of course, unavailable. It is estimated, however, that there are between 50,000 and 100,000 illegal immigrants in Metropolitan Toronto alone. Such estimates are very crude and may not reflect reality. However, if only a fraction of that number actually are here, it affects greatly the level of parasitic disease in the community. As well, the total number of travellers, technical advisors and others who have been to areas with high endemic levels of intestinal parasites is virtually unknown. Such people are often exposed to parasites and they are not usually screened on return. This adds to the rising parasite infection rate in Canada and adds somewhat to the risk of communicability of some of the conditions.

Immigrants themselves are required to have a physical examination prior to departure to Canada. Included with this examination are chest x-ray (for those over eleven years of age), urinalysis, VDRL (for persons over fifteen years of age) and a stool examination for ova and parasites. The procedure is valid for six months and must be repeated if a longer period has elapsed. The Department of Immigration has the power to order such check-ups for sponsored immigrants, people applying for work permits and visitors here for an extended length of time. These include stool exams for immigrants from endemic parasitic regions. If parasites are found, a letter is sent to the Ontario Ministry of Health who in turn notify the municipal health department for follow-up (10).

The records of the federal Department of Immigration show that 15,969 examinations were done in 1975 and 14,662 in 1976. Of

those, approximately 35% were positive for parasites. Many of those stool samples were sent via the mails to the provincial laboratories (10). This procedure would mean that the 35% is undoubtedly low compared to the true picture since a number of days in transit would cause certain parasitic forms to disintegrate and, therefore, escape detection. In 1974, over 27,000 stools for ova and parasites were done by the public health laboratories in Toronto. The sources of these samples were immigrants, travellers and various other categories of patients. Of those, 47.6% were positive for some form of parasite. There were nineteen species of protozoa and twenty-three species of helminths (12).

Records of the Clinic for Tropical and Parasitic Diseases at the Toronto General Hospital indicate that the number of patients of all types is increasing drastically (see Figure III). This could be as a result of an increased awareness of parasitic conditions and, therefore, diagnosis, but more likely it reflects a real increase in travellers and immigrants. At the clinic, 1974 through 1976, the types of patients seen, with corresponding percentages, were as follows in Table I.

Table I

	<u>1974</u>	<u>1975</u>	<u>1976</u>
Immigrants	45.48	58.11	56.35
Foreign Advisors <u>/1</u>	16.00	14.21	13.54
Missionaries	6.75	7.23	7.74
Travellers <u>/2</u>	27.44	17.84	19.16
Canadian Residents <u>/3</u>	3.71	2.17	2.88
Other <u>/4</u>	<u>.62</u>	<u>.44</u>	<u>.33</u>
	100%	100%	100%

/1 This includes diplomats, persons working with CIDA, CUSO, etc.

/2 The absolute number of travellers is not decreasing, the relative percentage is.

/3 These persons have not travelled and picked up their parasites locally.

/4 This includes foreign students, visitors, etc.

It is interesting to note that the clinic sees mostly immigration patients. The great majority of these patients are referred by general practitioners, medical officers of health, missionary groups, etc.

It is also interesting that Canadian residents make up only between two and three per cent of patients seen. There could be several possible explanations for that fact. The parasites themselves may not be very communicable in the Canadian setting, given the treatment of the water supply and efficient sewage system.

The low figure could also reflect to some degree the lack of utilization of stool exams for ova and parasites by the health care system in general in Canadian residents. Often more sophisticated procedures are ordered (eg. bowel x-rays, fat studies, etc.) for mild bowel upsets. A history of contact with immigrants or travellers, or even no history, given the present growing level of parasites indicates that stool for ova and parasites should probably be the first test ordered.

Figures of the City of Toronto, Department of Public Health, indicate that the rates (per 100,000 population) of some of the parasitic diseases are by far more common than many of the infectious diseases in this setting.

The rate of giardiasis in 1975 was 87.7, that of amoebiasis (*E. histolytica*) was 39.5. In 1976 these figures were 109.7 for giardiasis and 49.1 for amoebiasis. The increase is probably a result of an increasing awareness in the public health sector of the importance of these diseases. In 1976 the public health department started to collect data on other communicable parasitic diseases. Figures, therefore, are not available for other years for comparison. A summary follows, in Tables II and III.

Table II

<u>Parasite</u>	(Rates per 100,000)	
	<u>1975</u>	<u>1976</u>
Amoeba (E. histolytica)	39.5	49.1
Giardiasis	87.7	109.7
Non-invasive Amoebae (E. coli, E. nana, D. fragilis, E. hartmanni)	--	40.7
Ascariasis	--	71.4
Trichuriasis	--	136.9
Clonorchiasis	--	35.8
Tapeworms (all kinds)	--	2.8

For comparison, rates of common communicable reportable diseases are seen in Table III

Table III

<u>Disease</u>	(Rates per 100,000)		
	<u>1974</u>	<u>1975</u>	<u>1976</u>
Chickenpox	155.8	230.4	146.0
Measles	59.7	20.0	18.0
Streptococcal throat and Scarlet Fever	48.1	15.2	11.4
Meningococcal Infection	2.5	2.2	2.8
Mumps	55.0	47.6	86.5
Rubella	66.7	18.1	9.14
Viral Hepatitis			
Hepatitis A	15.5	9.3	10.17
Hepatitis B	2.5	7.3	5.6
Unspecified	6.6	3.1	3.7

Two things are made obvious by these statistics. Firstly, the rate of many parasitic diseases is far higher than some of the commonly known infectious diseases in the City of Toronto. Secondly, the actual rates are far higher than these figures indicate since many cases are most probably unreported and many are undetected.

Parasitic disease in this setting is not as transmissible as some of the communicable diseases mentioned but some communicability does exist. That fact is borne out by the fact that between two and three per cent of patients seen at the Tropical Clinic, Toronto General Hospital have never travelled.

Significance of intestinal parasitic disease must also be viewed, however, in terms of morbidity and resultant impact on the individual and in terms of costs of misdiagnosis, referral and the impact on health costs.



Figure I

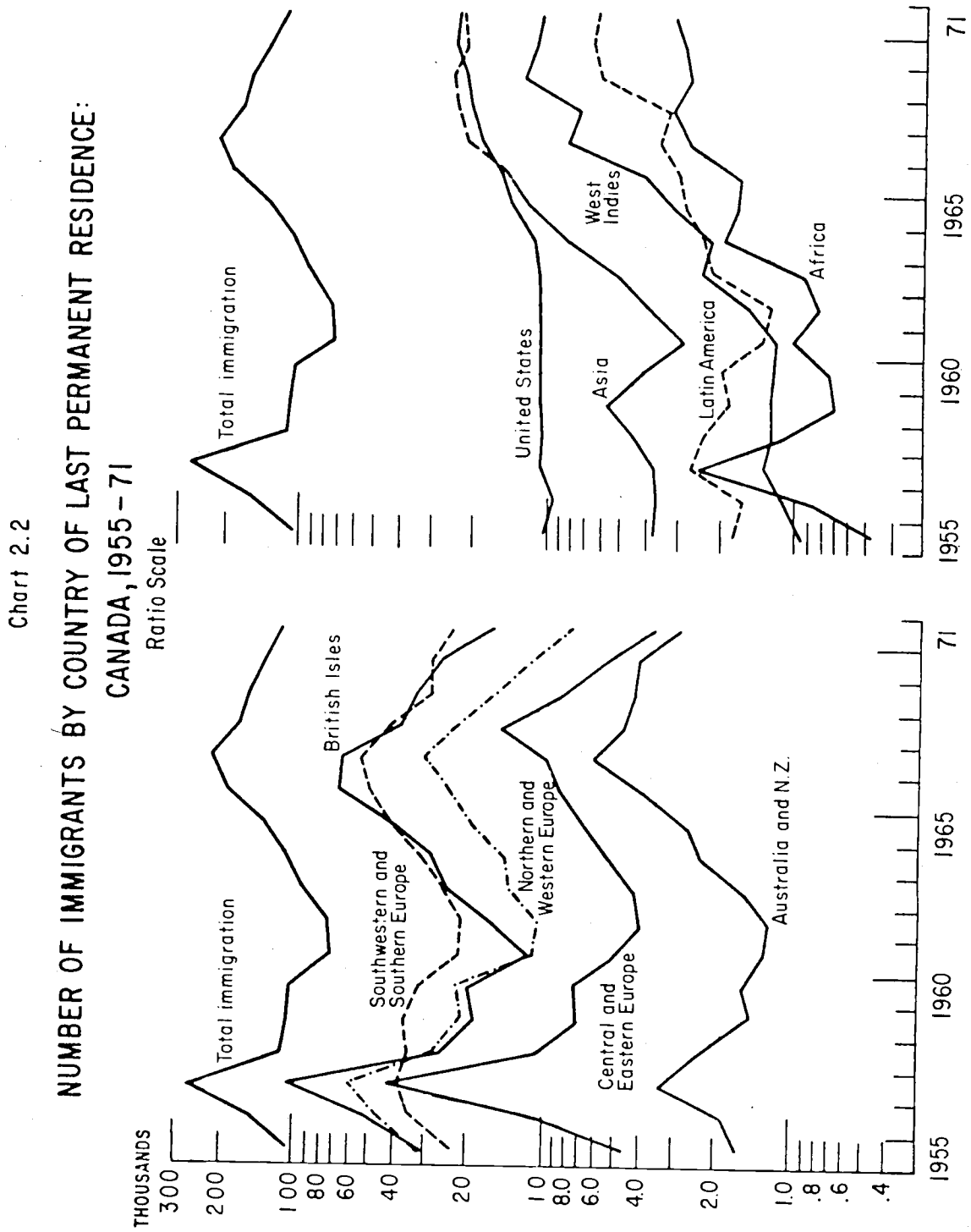
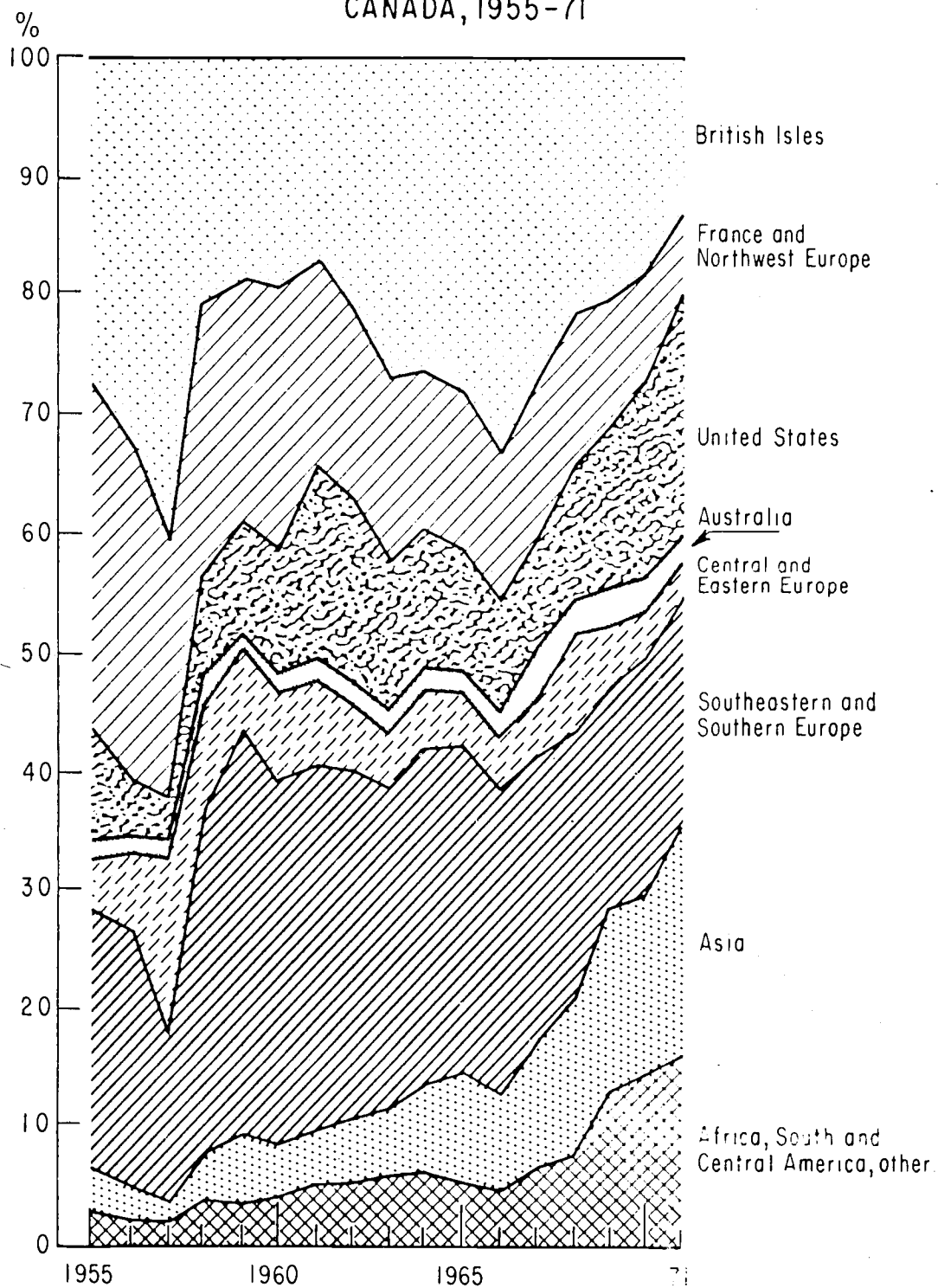


Figure II

Chart 2.3

PERCENTAGE COMPOSITION OF IMMIGRANT ARRIVALS  
BY COUNTRY OF LAST PERMANENT RESIDENCE  
CANADA, 1955-71



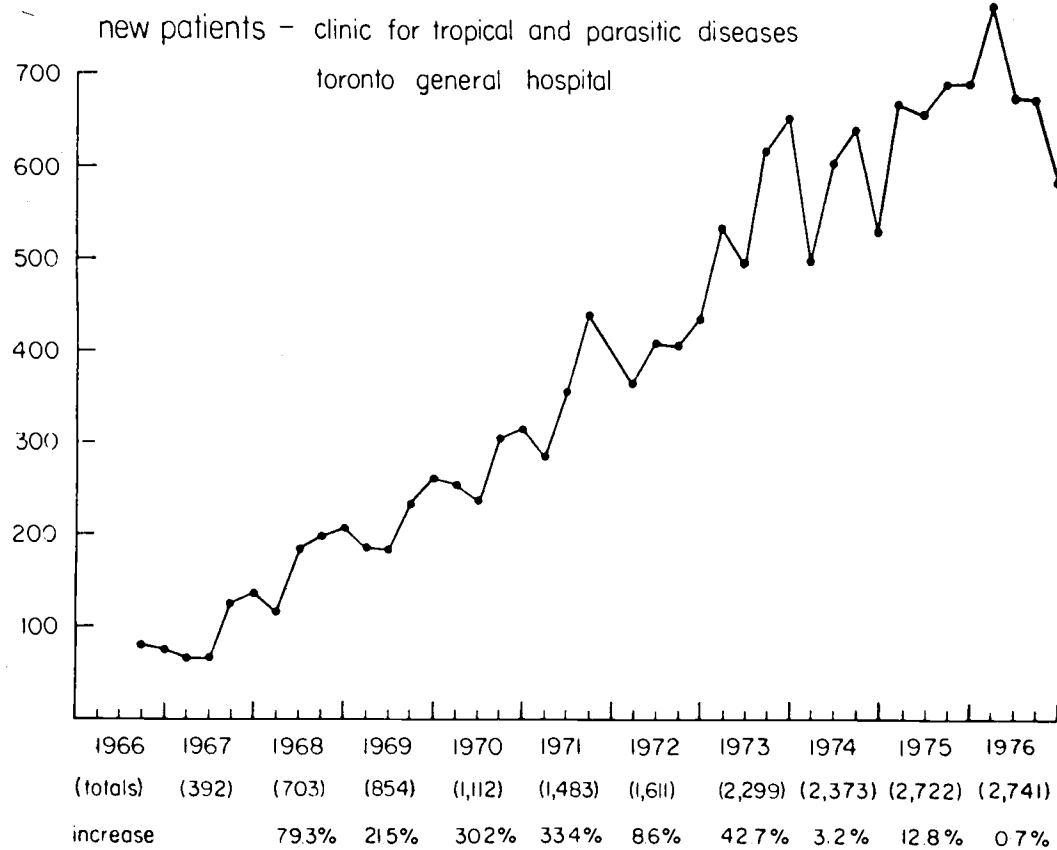
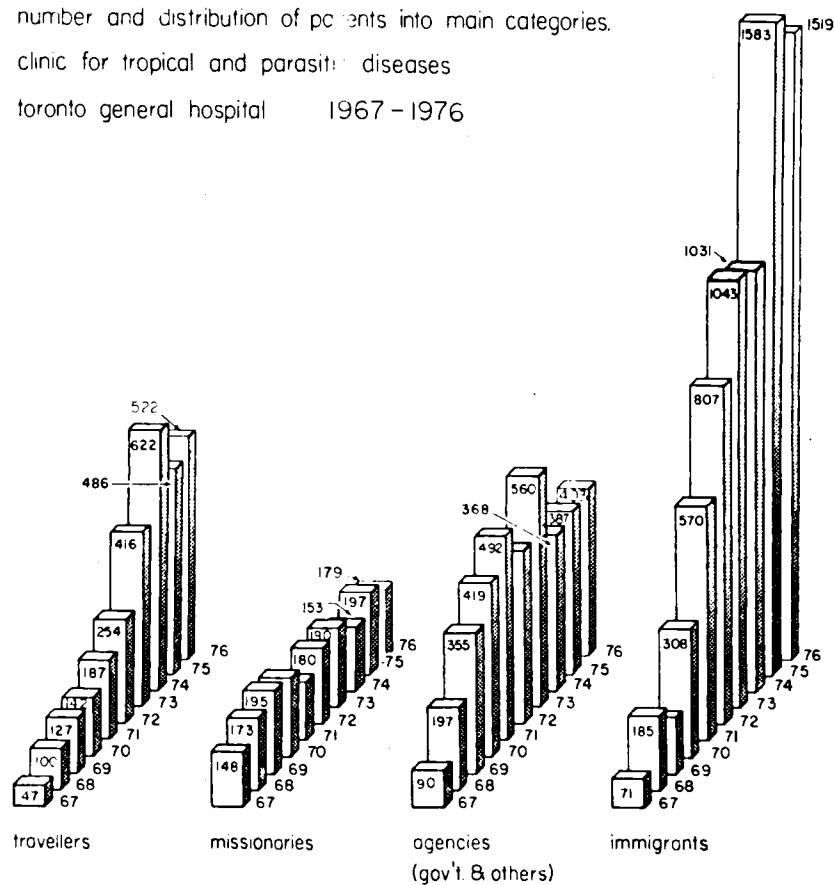
SOURCE: Annual Reports, Department of Manpower and Immigration

Figure III

number and distribution of patients into main categories.

clinic for tropical and parasitic diseases

toronto general hospital 1967 - 1976



# PARASITES WHICH CAN BE HANDLED AT THE PRIMARY HEALTH CARE LEVEL

Clinical parasitology can be a complex and intriguing field of diagnosis and therapeutics. On a day to day, basic level however, it should be a simple, straightforward exercise of basic principles.

Of the patients referred to Toronto General Hospital Clinic for Tropical and Parasitic Diseases in 1974 through 1976, a high percentage were treatable by the general practitioner. If one considers *E. histolytica*, non-invasive amoebae, malaria, giardia, trichuris, ascaris, enterobius, strongyloides, hookworms, most cases of clonorchiasis, and tapeworms as treatable at primary health care level, the following table shows the percentage of these above parasites which made up the total number of parasites seen at the clinic.

Table IV

Percentage of Parasites Seen at Specialty Clinic Which Were Treatable  
At Primary Health Care Levels

1974	-	96.3%
1975	-	94.1%
1976	-	94.7%

Similarly, of parasites reported at the Borough of York, Department of Public Health, for the last four months of 1975 and all of 1976, 96.8% were treatable by the primary health care system.

If this situation could be controlled, the specialty clinics could devote their time to management of complex parasitological problems and also begin very much needed research in this area. At the present time, the load of treating common parasites is so great that no such research is feasible.

The commonly referred parasites which can be handled by the primary health care system are briefly discussed.

#### A. Amoebiasis

*Entamoeba histolytica* is a protozoa which has a distribution in all populations throughout the world (2). It is more prevalent in tropical areas but has been found as far north as the Arctic, as well as in temperate zones (1). In some parts of the world, *E. histolytica* has been found in 50% to 85% of the population - for instance in Egypt, South and West Africa, Mexico, South America and the Far East (3).

Tropical conditions of temperature and humidity, etc., as well as waste disposal techniques and the use of night soil as fertilizers all combine to make amoebiasis a significant problem. The disease is transmissible from man to man by hand, food or fomite contact (i.e. by ingestion of cyst stage organisms) (3,1,2).

In the North American setting the organism is unlikely to survive sewage or water treatment plants. However it can be quite resistant to chlorine. Also, the organism is destroyed by  $-5^{\circ}\text{C}$  (2) and Canadian winter would prevent survival of any infective cysts in the environment. *E. histolytica* is therefore less of a

public health hazard in most major communities in Canada than in the tropics. However, direct spread by man to man contact or through food is certainly possible and is presently happening. Family units are especially prone to transmit the organism within the group in a Western setting. Despite our level of sanitation, epidemics have occurred, often through the water borne route, in North America (1).

The asymptomatic or mildly symptomatic carrier of *E. histolytica* is usually diagnosed only by accident through screening tests. It is common, therefore, for a person not to know he has the communicable disease or to pass off mild symptoms as the "flu". Often it is the asymptomatic carrier who develops the major complication of amoebic abscess in the liver, lung or less frequently the brain.

Lower socioeconomic status seems to be related to infection rate. In the U.S.A. it is estimated that 3% of the population is infected. Most of these cases are mildly symptomatic or asymptomatic (1).

*E. histolytica* infection is therefore a significant disease in the Canadian setting. Its treatment, especially at the early stages, can significantly alter morbidity. Such treatment is completely within the therapeutic and diagnostic range of the primary health care system.

## B. Giardiasis

*Giardia lamblia* is an intestinal flagellate of which man is the only known reservoir. It is transmitted by the fecal-oral route with water often being the vehicle in epidemics. The symptoms produced can be diarrhea, bloating and gas and a significant lassitude. The organism has been linked with lactose intolerance in chronic infections as a result of blunting of the villi in the small intestine.

Epidemics of this organism are known to occur in institutional settings, especially in schools with younger age group children where hygiene is poorer.

In older texts *giardia lamblia* was often listed as a non-pathogen but recent studies and experience have indicated that in the community setting it is a communicable and clinically significant disease. Its management should be totally at the primary health care level.

## C. Trichuriasis

*Trichuris trichiura* is a nematode worm commonly called a whipworm. Man is the principal host but it has also been found in monkeys and pigs (1). The infection with the worm in this country is asymptomatic except if parasite load is very great.

The transmission cycle requires ten to fourteen days for embryonation in the soil (2). An egg swallowed before such embryonation occurs would not be infective. Under Canadian conditions the life cycle could be completed in summer months only. In practice, however, transmission is rare.

The life span of the worm in vivo is four to six years (up to seven or eight). After that time the parasite dies out. It is, therefore, debatable whether trichuriasis needs to be treated at all in the North American setting. It is probably of little public health significance and if treatment is necessary, it is simple and also can be totally handled by the primary health care system.

#### D. Ascariasis

*Ascaris lumbricoides*, the long roundworm, is the most cosmopolitan of the nematode worms (2). Found in most countries of the world, it often frightens its host by being expelled with a bowel movement and thereby announcing its presence. In the rare case, with heavy worm load, ascaris can be clinically more aggressive. It can migrate in the bowel, perforate into the peritoneal cavity or cause intestinal obstruction. Heavy worm loads can also cause debility.

In a North American setting, however, the parasite is of concern usually only to the host. It requires a period of embryonation in the soil and sewage disposal systems and climatic conditions here are not ideal for completion of its life cycle. The life span is approximately a year for the adult after which time the host will be cleared.

Therapy is uncomplicated and is well within the range of expertise of the primary physician.



### E. Non-Invasive Amoebae

Endolimax nana, entamoeba coli, iodamoeba butschlii, entamoeba hartmanni and dientamoeba fragilis are all grouped together as non-invasive amoebae (in fact D. fragilis is actually a flagellate). They are not known to invade and destroy gut tissue as E. histolytica does (except for one report by Derrick, 1948, in which I. butschlii was reported in abscess form) (2).

Most references attribute no symptomatology to E. nana, E. hartmanni and E. coli (1). However, some clinicians claim that they can cause mild gastrointestinal disturbances. The chief importance of E. hartmanni is its possible laboratory misdiagnosis since it resembles E. histolytica closely and some experience is essential for the differentiation.

As a public health hazard in Canada, therefore, these organisms are of debatable importance. It is true that they are transmissible through foods and food handlers should probably be cleared of the parasitism but it is a moot point as to how vigorously they must otherwise be controlled. It is possible that, for example, in immunologically compromised patients these organisms could constitute a threat. Research along these lines is a requirement for final conclusions to be drawn as to their importance. In any case, if eradication is desirable, drugs are available (see Appendix I) to the primary health care physician.

## F. Taeniasis

The more common tapeworms, *taenia saginata* (beef), *taenia solium* (pork) and *diphyllobothrium latum* are not unknown in Canada. They are more common in countries where animal husbandry, meat inspection and food habits differ from ours.

There is no direct communicable public health problem with these parasites since the life cycle is complex and requires intermediate hosts. Transmission therefore is not of concern at the primary health care level. In the case of *taenia solium*, however, therapy must be properly carried out in order to prevent cystocercosis.

Another member of this family, *hymenolepis nana* (dwarf tapeworm) is easily transmissible directly from person to person without an intermediate host. Children are often infected with this parasite and auto-infection is common and can produce heavy parasite loads. In such cases, the infection can be symptomatic.

It is of public health importance as an easily transmissible parasite but, again, treatment is readily available.

## G. Enterobiasis

Pinworms are among the most common parasites in this society. They are common in children and many families are familiar with their symptoms and treatment. They are mentioned here, however, since cases are on occasion referred by primary care physicians.

## H. Hookworms

The two hookworm species, *ancylostoma duodenale* and *necator americanus* are now commonly reported in Canada. The human form is essentially a tropical parasite in that a stage of embryonation of eggs is required in the soil. There is no public health importance to this parasite in Canada as a communicable disease but clinically the worms can cause significant anemia through blood loss. Travellers and immigrants seen as patients in Canada do not uncommonly have hookworm species found in the stool samples.

Therapy is simple and should be carried out at primary health care level.

## I. Other Intestinal Parasites

Other parasites relatively frequently reported follow.

1. *Clonorchis sinensis*, the so-called Chinese liver fluke, is not transmissible in Canada and is, therefore, of little preventive importance. The parasite is difficult to treat, however, and can cause liver damage. In most cases, where fluke load is low, the parasite is innocuous for all intents and purposes.
2. *Strongyloides stercoralis* is a nematode resembling hookworms morphologically. It is a parasite with a varied and flexible life cycle that can include embryonation in soil but also in the gastrointestinal tract of the host. As a result, auto-infection occurs and parasite load can become very high and is reflected in very high eosinophilia. The parasite can be symptomatic and in some

cases, as a result of auto-infection, worm load can become great and be life threatening. Long before such a situation arises, the primary physician can easily eradicate the infection if he just were to include parasites with a high eosinophilia and the symptomatic pattern, in his differential diagnosis.

#### J. Malaria

This blood sporozoite is for practical purposes classifiable into the fulminant falciparum malaria and the milder, more chronic form produced by plasmodia vivax, ovale and malariae.

It is surprisingly common for travellers and immigrants to become infected while overseas, and in the case of the chronic forms, present with undiagnosed symptoms for many months in Canada. Diagnosis on blood film need not be very difficult but the physician must be aware of the possibility. Differentiation between ovale, malariae and vivax is for the specialty clinic to worry about and should not concern the primary health care system. Differentiation is important, however, between chronic forms and falciparum since the latter requires quick and adequate treatment and the former requires a second drug for complete eradication.

Treatment itself is not complex and is well within the skills of the primary physician.

## DIAGNOSIS

One major requirement in dealing with parasitic diseases is that diagnostic facilities must be adequate. Some experience is required for microscopic detection and differentiation of parasites. Many laboratories offer the service with debatable ability to produce valid results and care must be taken in choosing a laboratory. Certainly the number of competent diagnostic facilities in this field will have to be increased if the parasitic problem is to be adequately handled.

Often laboratory reports are a long time in returning to the health worker requesting the parasitic analysis. In cases of communicable or debilitating disease, this is less than desirable. The sending of samples through the mail is, although necessary in some instances, not optimum in efficiency in most cases. Trophozoites disappear early from fresh stool specimens and, unless proper preservatives are used, even fixed samples can lose accuracy. The public health laboratories in Toronto use Schaudin's fixative which gives excellent results even with the delay of communication by post (12). Those laboratories are already overloaded with volume of work (17). The best answer, therefore, is to increase the number of technologists capable of doing everyday parasitological assessment of samples. This would not entail a completely specialized technologist in the field but a diversification of curriculum to include this subject.

With an increased number of these technologists scattered through the communities, samples could be processed more adequately and results would be more immediately available.

To some extent training of technologists is going on under proper supervision. Dr. T. Sholten of the public health laboratories in Toronto gives special instruction to technologists in practical parasitology (17). The primary health care system must, of course, have access to adequate numbers of such technologists, geographically correctly located if the diagnostic problem of parasitic disease is to be handled. Apart from these special courses, the basic laboratory technologist curriculum does not prepare workers for this field (12, 17).

## THERAPEUTICS

On a worldwide scale there is a very great need for pharmacological research in the field of parasitic diseases. The major parasitic diseases of tropical areas are, out of necessity, sometimes treated with toxic and archaic medications. This is not the case in primary level parasitology. Drugs are available at most pharmacies for the vast majority of parasites referred in Canada. Pharmacies which do not stock these medications should be able to order most of them without problem. With few exceptions these basic drugs are relatively free of toxicity. It is a myth that all parasitic drugs are more dangerous than the parasites themselves. For some more complex parasites this fact can be true, but not for the basic diseases in question here.

Some alternative drugs are on control drug lists but it is not usually necessary to use them at primary health care level. These are the arsenicals such as bemarsal (diphetarzone) and carbarsone. On the other hand, experience has shown that bemarsal is remarkably free of side effects when its use as an intraluminal amoebicide is indicated. Perhaps a more liberal distribution policy of this drug is indicated in the light of the present problem with parasitic disease. Certainly far more potentially toxic drugs are dispensed daily by the health care system. Cardiac drugs, hypnotics and some antibiotics are perfect examples of this fact. However, even without the control drugs, the general practitioner's armamentarium is adequate.

The reader is referred to Appendix I for a list of simple parasitic diseases most commonly referred in Toronto. All of the drugs listed are available in pharmacies except as indicated (bemarsal and carbarsone). They are all simple to administer and ample information is available on them in the form of package brochures, pharmacology texts and texts on clinical parasitology.



## WHICH PARASITIC DISEASES SHOULD BE REFERRED

Complex parasitological diagnoses are not for the average laboratory. Reference laboratories exist which can help in the less common conditions. Centre for Disease Control in Atlanta as well as centres in Toronto and Montreal have serological and specimen facilities.

Some parasitic conditions cause irreversible destruction of tissue or entail the use of toxic substances such as antimony and arsenicals. Such cases are not for diagnosis and treatment at primary health care level. It is possible, of course, that some physicians experienced abroad could competently handle complex parasitology but for the average Canadian physician referral would be in order.

Any parasitic condition of consequence which does not respond to usual or repeated drug therapy may be more complex than first perceived and should probably be referred.

Any malaria case which does not respond fairly dramatically within twenty-four to thirty-six hours should probably be referred or help should be sought by the less experienced physician. Resistant strains of malaria to the usual therapeutic regimes have emerged in recent years. Still, however, most malaria cases will respond in the usual way.

Trematode diseases such as schistosomiasis, symptomatic clonorchiasis or paragonimiasis are best left alone by inexperienced workers.

Blood and tissue parasites such as the various filarial worms (*W. bancrofti*, *B. malayi*, *loa loa* and *O. volvulus*) are more complex in their presentation and therapeutics and should probably be referred. This is also true for trypanosomiasis, leishmaniasis, complicated toxoplasmosis, visceral larva migrans, trichinosis and echinococcal disease. Undiagnosed eosinophilia of tropical origin should be referred.

The list could go on and sound impressive and perhaps prohibitive but it is not meant to be so. The intelligent physician who has the wherewithal to make the diagnosis in a community where referral is less feasible can, with some interested reading and some telephone consultation, clear many of these more complex parasites. All he or she need do is to take them out of the realm of the mysterious and exotic and into the same frame of reference as any other disease seen. For some reason, Canadian physicians have had trouble doing this in the past.

## CONCLUSIONS

A problem, therefore, definitely exists in Canadian settings such as Toronto with respect to parasitic diseases. The various parasites, some of them communicable, most of them significant in that they are costly to the health system in misdiagnosed, mistreated and unnecessarily referred patients, exist at surprisingly high rates.

What is required of the primary health worker then, is to become aware that we are seeing these parasites in Canada. Once aware, the worker, be it nurse, inspector or practitioner, should not fear them or ignore them but do some simple study to learn about them. Straightforward, uncomplicated and relatively inexpensive texts are available for such a purpose. For example, reference number 1, Brown, H.W. Basic Clinical Parasitology, covers each parasite at a practical level in a few pages. The book is up to date (1975) in therapeutics and with a little study, every health worker involved with parasitic work could easily become familiar with the necessary techniques.

As well, diagnostic capabilities of the health care system must be made more accessible to all primary health care physicians dealing with parasitic diseases. Technologists properly trained must be located in areas where practitioners can make faster use of their expertise.

Drugs must become more readily available in local pharmacies in areas where parasitic diseases are more common. Physicians have to learn about these drugs and use them correctly and realize that the common medications are not the toxic ones of complex parasitology.

With this three-pronged shift of, primary health worker, diagnostic facilities, and pharmacological availability, the primary health care system can more than adequately handle the parasitic diseases which are becoming so common in practice today.

## Appendix I

## Clinical Management of Commonly Encountered Parasites

Parasite	Drugs of Choice	Comments, Problems and Precautions
Trichuris trichiura (Whipworm)	1.Mebendazole(Vermox) 2.(Bemarsal) 3.(Carbarsone)	Bemarsal and Carbarsone are arsenicals and are on control drug lists
Ascaris lumbricoides	1.Piperazine citrate 2.Alcopar 3.Mebendazole	1.Piperazine not to be used in epilepsy or with history of any convulsions 2.Ascaris should be treated first in mixed infections
Enterobius vermicularis (Pinworms)	1.Vanquin 2.Mebendazole 3.Piperazine	May require 2 or 3 doses several weeks or so apart. Whole household should be treated simultaneously
Hookworms (Ankylostoma)	1.Alcopar 2.Thiabendazole 3.Mebendazole	Can be relatively resistant to one drug
Strongyloides stercoralis	Thiabendazole	Can have a very high eosinophilia
Trichostrongyloides	1.Thiabendazole 2.(Bemarsal)	
Taeniasis (Tapeworms) (T. saginata) (T. solium) (D. latum) (Hymenolepis nana)	Niclosamide (Yomesan)	For tinea solium antiemetic precaution <u>must</u> cover Yomesan therapy
Giardia lamblia	1.Flagyl 2.Atabrine	Empirical experience indicates a low fat gastric III diet may aid therapy

continued .....

## Appendix I (continued)

Parasite	Drugs of Choice	Comments, Problems and Precautions
<i>E. histolytica</i>	1.Flagyl + Furamide 2.Flagyl + (Bemarsal) 3.Emetine	Furamide not commonly available but can be ordered by pharmacies (10 days of Flagyl 250mg. tid pc followed by 5 or 10 days of Furamide 500mg. tid pc)
Non-Invasive Amoebae ( <i>E. hartmanni</i> ) ( <i>I. butschlii</i> ) ( <i>E. coli</i> ) ( <i>E. nana</i> ) ( <i>D. fragilis</i> )	1.Furamide 2.(Bemarsal)	5 or 10 day course of Furamide (500mg. tid pc)
Malaria ( <i>Falciparum</i> ) (Vivax) (Ovale) (Malariae)	1.Chloroquin phosphate (250 mg.) 2.Followed by Primaquin (in vivax, ovale and malariae)	Standard practice is: 1.4 stat, 2 in 6 hours then 2 daily for 2-3 days: OR 2.2 stat, 2 in 6 hours then two 6 hours after that, followed by 2 tabs daily for 2-3 days. If response is not dramatic in 24-36 hours, ask advice or refer.
Clonorchis sinensis (Chinese liver fluke)	Chloroquin phosphate	One tab bid for 14 days. Refer any case with signs or symptoms

## Appendix II

## General Rules in Treating Intestinal Parasites

1. Treat roundworms (nematodes) first if there is combined infection of several types of parasites.
2. Of the nematodes, treat *ascaris lumbricoides* first.
3. Give adequate doses and ensure that the patient takes the required amount. Treatment can be prolonged and patients often falter.
4. Do follow-up stool examinations (one or two for most intestinal parasites, three for *E. histolytica*).

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